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Volume 1, No. 3,
March, 1915.

AGRICULTURAL EDUCATION MONTHLY.

U. S. Department of Agriculture,
Office of Experiment Stations,
Agricultural Education Service.

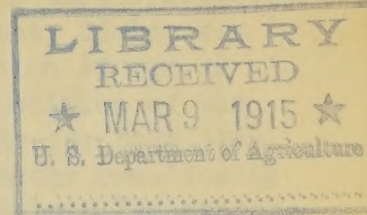


Table of Contents.

	Page.
The San Jose Scale--A Lesson for Secondary Schools.....	14
News Items.....	20
Recent Agricultural Books and Bulletins.....	22

THE SAN JOSE SCALE--A LESSON FOR SECONDARY SCHOOLS.

Few secondary schools have a separate course in economic entomology. Important as the subject may be the great majority of the high schools do not have at the present time either the time or the equipment for teaching such a course. The relation of insects to plant production is usually taken up in connection with courses in field crops and horticulture. The problem before teachers is to arouse an interest in the study of insects and to get results that are practical in the limited time available. Some schools are solving the problem by devoting the time to a few of the more common representative pests rather than attempting to cover the subject in a broad way. In presenting the lesson which follows it should be borne in mind that the aim should be to bring out the elements of entomology, and to arouse interest in the study of insects, as well as to give practical instruction in regard to the control of a dangerous pest.

I. Class Room Discussion.

1. ORIGIN AND IMPORTANCE OF PEST.--"The San Jose scale is now known to be of Chinese origin. Its name is derived from its first point of colonization in America, namely, at San Jose, Cal., and is, in a sense, undesirable, as giving an unmerited notoriety to the district in California which had the misfortune of being the accidental place to first harbor it. A more appropriate designation is the Chinese Scale, but it is improbable that a new name will ever be adopted for an insect which has become so thoroughly well known and exploited under its original designation.

"Probably no other insect has had so much notoriety as has this species, and certainly none has assumed so great an international importance, as indicated by the vast amount of interstate and foreign legislation which has been enacted relative to it. In all the earlier publications of this office, beginning with Comstock's original description and note in the Report of the Department of Agriculture for 1880, the very great economic importance and capacity for harm of this scale insect has been commented upon and the fact that there is perhaps no insect capable of causing greater damage to fruit interests in the United States than the San Jose or pernicious scale.

* U. S. Dept. Agr., Bur. Ent. Bul. 62(1906), pp. 7, 8.

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Table of Contents.

Page.	
14	The San Jose Scale--A Lesson for Secondary Schools.
20	New Issues.
22	Recent Agricultural Exports and Imports.

THE SAN JOSE SCALE--A LESSON FOR SECONDARY SCHOOLS.

The secondary schools have a separate course in economic entomology. In part, as the subject of the great majority of the high schools do not have at the present time either the time or the equipment for teaching such a course. The relation of insects to plant production is usually taken up in connection with courses in field crops, and horticulture. The problem before teachers is to choose an interest in the study of insects and to set results that are practical in the limited time available. Some schools are solving the problem by devoting the time to a few of the more common representative pests rather than attempting to cover the subject in a broad way. In presenting the lesson which follows it should be borne in mind that the aim should be to bring out the science of entomology, and to make a lesson in the study of insects, as well as to give practical instruction in regard to the control of a dangerous pest.

I. What Is a Scale?

1. DEFINITION AND IMPORTANCE OF THE SCALE--The San Jose scale is now known to be of Chinese origin. The name is derived from the first point of introduction to America, namely, at San Jose, Cal., and it is a scale, undoubtedly, as the name suggests. It is an important pest of the citrus fruits and the relation of the scale to the citrus fruit is of great importance. It is a very serious pest of the citrus fruit, and it is important that a new name will soon be adopted for an insect which has become so thoroughly well known and explained under the present designation.

"Probably no other insect has had as much activity as has this species, and certainly none has assumed as great an international importance, as has this insect. It has spread from its native land to all parts of the world, and it is now one of the most important pests of the citrus fruit in the United States. It is a very serious pest of the citrus fruit, and it is important that a new name will soon be adopted for an insect which has become so thoroughly well known and explained under the present designation.

"It is inconspicuous and often for a time passes unnoticed or unrecognized. Meanwhile its enormous fecundity enables it to overspread the trunk, limbs, foliage, and fruit of the tree attacked, so that it is only a question of two or three years, unless proper remedial steps be taken, before the condition of the plant becomes hopeless or its death is brought about. In capacity for harm this species probably exceeds any other scale insect known, and it attacks practically all deciduous plants, both those grown for fruit and the ornamentals. Its economic importance is further increased by the ease with which it is distributed over wide districts through the agency of nursery stock, and the difficulty and, as a rule, impossibility of exterminating it where once introduced. Its capacity for evil, which was recognized in its earlier work on the Pacific coast, was at once even more strikingly demonstrated on its first appearance in the East, and before measures of control were undertaken it was much more disastrous in peach orchards of Maryland, New Jersey, and other eastern and southern States than in California and the West.

"Since its appearance in the Atlantic seaboard in the early nineties it has, in spite of all efforts at control in nurseries and by State quarantine, spread well over the eastern and middle United States and into Canada, so that there are now very few regions where fruit growing is at all important in which it has not gained permanent foothold. Maine and a few of the middle western States have not so far reported this scale insect, but it is only a question of time when it will complete its extension over the entire fruit-growing areas of North America within its climatic range."

2. HISTORY OF THE SCALE IN AMERICA.--The San Jose scale was first established in this country in the early seventies at San Jose, Cal., in the grounds of Mr. James Lick. From this point it spread slowly over California and the States west of the Rocky Mountains. Its occurrence in the East was first discovered in 1893 at Charlottesville, Va. It appears to have been introduced into two large nurseries in New Jersey from which it was distributed throughout a large area.

3. DESCRIPTION OF INSECT AND ITS INJURY.--"The mature San Jose scale is small, grayish in color, circular in outline, somewhat convex, and with a nipplelike prominence in the center. The female scale is about 1 millimeter in diameter (about the size of a pin head); the male scale is much smaller and elongate. The insect itself is beneath the so-called scale, this being simply a waxy covering secreted by the soft, helpless, yellow 'louse' for its own protection. Where trees and plants are but slightly infested its presence is not readily detected by the casual observer, but in the case of severe infestation the bark of the tree and limbs will present an ash-gray appearance, and on closer examination will be found thoroughly incrustated with the scales, which, when scraped with a knife, will produce a yellowish, oily fluid. When the scales are abundant on the tree the foliage also will be thoroughly infested, giving it a spotted and diseased appearance readily observable some feet away.

"The San Jose or Chinese scale (*Aspidiotus perniciosus* Comstock) infests practically all portions of its host plants that are above ground--the trunk, limbs, and branches--and when abundant it may occur on the leaves and fruit. Injury results from the extraction, by the scale insects, of the juices of the plant. At first this merely checks growth, but as the insects increase in number the speedy killing of the branches and twigs follows, resulting finally in the death of the plants. In addition to the extraction, by the scales, of sap as food,

* U. S. Dept. Agr., Bur. Ent. Circ. 124 (1910), pp. 1, 2.

the puncturing of the bark by the slender sucking mouth-parts results in a diseased and often pitted condition; the inner bark, or cambium, showing a reddish discoloration, as exposed in cutting with a knife, and the bark itself may crack, in stone fruits exuding drops or masses of gum. A reddening effect is also much in evidence as red rings around the scales on the bark, especially of the apple and pear, and on the fruits of these plants, though not characteristic of any one scale species.

"On peach the scales have a tendency to infest to a greater extent the older limbs and branches than the newer growth, as the wood 1 year old. On apple and pear, the terminal twigs are quite generally infested, and many of the young may find their way to the fruit, settling principally in the calyx and stem cavities. Most varieties of fruit trees and plants infested from the nursery, in the absence of treatment, perhaps never reach fruiting condition. Peach trees will usually be killed in two or three seasons, while pear or apple trees will maintain a feeble existence much longer. This insect, on account of its great similarity to certain other species of scale insects, may not be positively determined except by specialists. The occurrence of diseased and dying branches showing severe scale infestation furnishes strong presumptive evidence of the presence of this pest, but specimens of infested twigs should be promptly submitted to a qualified person for examination."

4. LIFE HISTORY AND HABITS.--"The San Jose scale passes the winter in an immature condition fixed to the bark of the host plant, the small, dark-gray or blackish scales being just discernible with the unaided eye. In early spring, with the ascent of the tree's sap, the growth of the scale begins, and early in April in the latitude of Washington the small, two-winged, active males issue from the male scales. After mating with the females the males die. The females continue to grow and in about a month begin the production of living young--minute, yellow, oval creatures, which by very close observation may be distinguished without the aid of a hand lens, crawling here and there on the infested plants in an effort to find a suitable place for settlement. The young insect is active for some hours but soon settles, pushes its slender, threadlike beak into the plant, and begins to feed by sucking out the sap. After this there is no further movement from place to place, and the waxy covering, which often begins to develop before the insect has settled, soon covers it completely.

"In about twelve days the insects molt and from this time on the male and female scales may be readily distinguished. Eight or ten days later the males change to pupae, and in twenty-four to twenty-six days from birth the adult males emerge and fecundate the females, which in turn reach maturity and begin the production of young in from thirty-three to forty days from birth. An individual female may give birth, on the seasonal average, to about 400 young, and as the life cycle of the female covers but a few weeks there may be several generations a year, the number varying according to latitude. The progeny from one parent during the season have been estimated at 1,608,040,200 females. It is thus easy to understand how the insect can so quickly destroy the plants infested and why prompt remedial measures are so necessary. With the approach of the cool weather of fall, breeding gradually ceases and the scales in all stages enter hibernation. Most of the older and also most of the younger individuals perish during the winter, the survivors being those about one-third or one-half grown, as stated."

5. MEANS OF DISTRIBUTION.--The San Jose scale infests practically all deciduous fruit trees, such as apple, pear, peach, plum, etc., and many ornamental

trees and shrubs. Its infection of shade trees has not been as bad as was at first feared. It is distributed from one region to another chiefly upon nursery stock. Most of the States have laws which prohibit shipment of infested stock and which require that plants be fumigated with hydrocyanic acid gas before distribution.

"After the insect once becomes established in a locality its spread is accomplished by various agencies. As explained under the natural history of the insect, it is capable of movement only during a short period after birth. During this crawling stage the insects are able to pass from tree to tree where the limbs are in contact. But it is by agencies independent of itself that it is principally distributed. Prominent among these factors are birds, which may alight upon infested trees, where the young insects may crawl upon their feet and be subsequently deposited in other trees, sometimes at distances quite remote. It is probable that the young are blown by strong winds from tree to tree; and they are carried by insects, such as grasshoppers, ladybird beetles, ants, etc. The crawling 'lice' may be transported considerable distances on the clothing of man, on vehicles, or on horses or other live stock which may be in orchards for any purpose.

"The suggestion that the insect may be disseminated by means of scale-infested fruit has been frequently made, but it is the consensus of opinion among American entomologists that this danger, while undoubtedly existing, is negligible." *

6. METHODS OF CONTROL.--In some sections this pest is controlled in a great measure by its natural enemies. Chief among the insect parasites are very small relatives of the bee. There are a number of ladybird beetles which feed upon the scale. In the South, especially, fungus diseases are effective in its control.

"The methods of control which have been especially followed in the Eastern States are (1) the lime-sulphur wash, (2) the soap treatment, (3) treatment with pure kerosene, (4) treatment with crude petroleum, (5) treatment with mechanical mixtures of either of the last two oils with water, and (6) petroleum emulsion with soap. All of these methods have proved themselves to be successful against the San Jose scale when properly carried out. As compared with the lime-sulphur wash, the others mentioned are more expensive, and the two oils, unless very carefully applied, are likely to injure the treated plants and are now seldom used. One's choice of method must therefore be governed by availability, special needs, and experience. In the main these remedies, including the lime-sulphur wash, are winter treatments and may be employed at any time when the trees are in dormant, leafless condition. The weaker oil-water mixtures and the emulsions may, however, be used in the growing season. The treatments enumerated are all for trees in the orchard. Nursery stock badly enough infested to require such treatment is best destroyed. For the general disinfection of nursery stock the hydrocyanic-acid-gas treatment is the standard and only satisfactory means." **

"For many years the cooked lime-sulphur wash has been the main reliance in the control of the scale. It is made according to the following formula:

Stone lime.....	20 pounds.
Sulphur (flour or flowers).....	15 do.
Water to make.....	50 gallons.

* U. S. Dept. Agr., Bur. Ent. Circ. 124 (1910), pp. 5, 6.

** U. S. Dept. Agr., Bur. Ent. Bul. 62 (1906), p. 73. (Directions are also given for making other spray solutions.)

"Heat in a cooking barrel or vessel about one-third of the total quantity of water required. When the water is hot add all the lime and at once add all the sulphur, which previously should have been made into a thick paste with water. After the lime has slaked, about another third of the water should be added, preferably hot, and the cooking should be continued for one hour, when the final dilution may be made, using either hot or cold water, as is most convenient. The boiling due to the slaking of the lime thoroughly mixes the ingredients at the start, but subsequent stirring is necessary if the wash is cooked by direct heat in kettles. If cooked by steam, no stirring will be necessary. After the wash has been prepared it must be well strained as it is being run into the spray pump or tank. The wash may be cooked in large kettles or, preferably, by steam in barrels or tanks.

"This wash has proved entirely effective in controlling the insect on all plants, so far as preserving their life is concerned, and has been especially satisfactory for stone fruits. For the apple, however, it has not in all cases been so satisfactory, as difficulty is experienced, especially in the case of large trees, in making the application sufficiently thorough to kill all the scales. The spotting of the fruit by the progeny of those that escape renders it unsightly for market purposes, though its intrinsic value is but little reduced. The presence of the scale is furthermore very objectionable for the reason that certain foreign governments and certain States in this country rigidly quarantine against fruits showing the presence of this insect. Consequently loss on fruit exported thus results to growers and dealers.

"Some apple growers rely principally upon the oil sprays, or use them at least every other year, alternating with the lime-sulphur wash, and in this way keep the scale well in check." * --

7. GENERAL SUGGESTIONS FOR SPRAYING.--**"Before spraying it is best to prune trees intelligently, to economize in the surface to be covered by the spray, also to rid the tree of perhaps its worst affected limbs. Burn parts removed. Prune out the dead wood, the undesirable water sprouts and suckers. Keep the trees from becoming bushy. Do not spray right after a rain while the limbs are still wet--try not to spray just preceding a rain. The spray should thoroughly dry on the limbs, thus giving it the best chance to adhere. An ideal spray day is a quiet, bright one, when the air is dry and cool. Study the formulas of sprays and the different makes of pumps and nozzles and use only the best fitted for your conditions, realizing that there is a proper time to spray and the best results are obtained only at such time. Spray thoroughly. I doubt if one-tenth of the people who spray do so correctly. Above all else, spray carefully, doing thorough work by covering not only one side but all sides of the twigs, not only the growing tips but also the branches and trunks of the trees. I was greatly surprised last winter to find one of our leading orchardists, a man who has sprayed for years, spraying carefully the branches and twigs of his peach trees, leaving the trunks unsprayed. He thought there was no scale upon the trunks of the trees, and only was he convinced to the contrary when multitudes of scale were shown him there.

"To spray a tree properly it is best to begin at the topmost branch and spray down, doing one side of the tree at a time. Should a breeze be blowing, take advantage of the same and spray but one side of the tree, going up one row and down another; when the breeze changes or becomes quiet complete the spraying of the trees. Spraying should be discontinued when a strong wind is blowing: likewise in cold, freezing weather the wash should not be applied.

* U. S. Dept. Agr., Bur. Ent. Circ. 124 (1910), pp. 12, 13. (Directions are also given for making other spray solutions.)

** Tennessee Sta. Bul. 98 (1913), p. 47.

"If you spray for several days with the lime-sulphur solution, smear vaseline upon the face and hands. Use a pair of oil or tar-soaked cotton gloves; the wash is caustic and coming in contact with the hands and face soon make the flesh tender. Care should be taken to have no leaks in the hose or nozzle. Use an extension rod, equipped with an angle nozzle.

"Spray when the trees are dormant; it does not matter of what age the trees are, boiled lime-sulphur solution does no injury if applied when the trees are dormant. If but one spraying can be given, I would advise early spring as the most effective time."

II. Practicums.

If San Jose scale exists in the community, arrangement should be made if possible for a practical lesson in spraying. The students should be prepared with suitable clothing that they may do the work under the supervision of the teacher. If no infested orchard is available, one laboratory period at least may be utilized by the students in mixing spray solutions. In an infected district if there is no time or equipment for practical spraying, a field trip to study the scale in the orchard would be a helpful supplement to the classroom discussion.

III. Suggested Project.

Where teachers are making use of the home-project plan in a district infested with San Jose scale, students may be asked to apply what they have learned in cleaning up an infected orchard as one of their projects.

IV. Community Work.

Many teachers welcome suggestions toward making their work of benefit to farmers of the community. A public demonstration of spraying to control the San Jose scale may be profitable. Such a demonstration may be carried on in cooperation with the county agent where one is employed or with other extension representatives of the State college of agriculture.

V. References.

Most of the State experiment stations have published results of experiments connected with the control of the San Jose scale or have issued circulars upon the subject. Each school should obtain publications upon the subject from the station of the State in which the school is located. In addition to the references already given Missouri Experiment Station Bulletin 98 will be found helpful if it can be obtained.

CODLING MOTH.

The codling moth may be taken up in a similar manner. The following references may prove helpful in giving a lesson upon this subject:

REFERENCES FOR STUDENTS:

- U. S. Dept. Agr. Yearbook 1907, pp. 435-445, The Codling Moth or Apple Worm.
- U. S. Dept. Agr., Farmers' Bul. 171 (1903), Control of the Codling Moth.
- U. S. Dept. Agr., Farmers' Bul. 492 (1912), The More Important Insect and Fungous Enemies of the Fruit and Foliage of the Apple.

New York Cornell Sta. Buls. 142 (1898) and 189 (1901), The Codling Moth.
(Contains bibliography of earlier publications).
Utah Sta. Bul. 87 (1904), The Codling Moth.
Missouri Fruit Sta. Bul. 21 (1909), Spraying Apples for Curculio and
Codling Moth

REFERENCES FOR TEACHERS WHO DESIRE TO TAKE UP A MORE EXTENSIVE STUDY OF
THE SUBJECT:

U. S. Dept. Agr., Bur. Ent. Bul. 80, pt. 1 (1909), The Codling Moth in
the Ozarks; pt. 5 (1910), On the Nut-Feeding Habits of the Codling
Moth; pt. 6 (1910), Life History of the Codling Moth in Northwest
Pennsylvania; pt. 7 (1910), The One-Spray Method in the Control of
the Codling Moth and Plum Curculio.
U. S. Dept. Agr., Bur. Ent. Bul. 115, pts. 1 and 2 (1912), Life-History
Studies on the Codling Moth in Michigan.
Washington Sta. Bul. 77 (1906), The Codling Moth in the Yakima Valley.
Illinois Sta. Bul. 114 (1907), Spraying for the Codling Moth.
Utah Sta. Bul. 95 (1906), Codling Moth Work in 1904.

NEWS ITEMS.

LIVE STOCK ON FARMS JANUARY 1, 1915.--According to a recent number of
"The Agricultural Outlook" * "the numbers of every class of live stock--that is,
horses, mules, milch cows, other cattle, sheep, and swine--increased during
the past year. Such general increase has not occurred in any of the previous
five years. The increase in numbers of horses amounted to 233,000, or 1.1 per
cent; of mules to 30,000, or 0.7 per cent; of milch cows to 525,000, or 2.5 per
cent; of other cattle to 1,212,000, or 3.4 per cent; of sheep to 237,000, or
0.5 per cent; of swine to 5,685,000, or 9.6 per cent. The total value of all
live stock on farms and ranges January 1 is estimated at \$5,969,253,000, an in-
crease of \$78,024,000, or 1.3 per cent, over the valuation of a year ago. Of
this total valuation nearly one half is for work animals, and the other half
for food animals. During the past year the prices as well as the total value
of work animals decreased, but the prices as well as the total value of food
animals increased. Swine alone of the food animals decreased somewhat in
price per head, although their aggregate value is higher than a year ago."

EFFECT OF WAR ON EXPORTS OF HORSES.--In the same number of The Outlook
G. A. Bell of the Bureau of Animal Industry of the Department states that
"during the four months September to December, 1914, inclusive, about 75,000
horses were exported from the United States. In addition to these several
thousand more have been purchased for export by the agents of the warring na-
tions. It has been feared by some that there would be such large numbers
exported as to cause an acute shortage of horses in this country. There is,
however, no apparent immediate danger of this.

"The 1910 census gave 3,182,789 as the number of horses not on farms.
There has probably not been any appreciable decrease in that number since then.
That number added to the 21,195,000, the number estimated by the Department of
Agriculture, on farms January 1, 1915, makes a total of over 24,000,000 horses in

* U. S. Dept. Agr., Farmers' Bul. 351 (1915).

1. The first part of the paper is devoted to a general discussion of the problem of the existence of solutions of the system of equations

$$\frac{dx}{dt} = f(x, y, z), \quad \frac{dy}{dt} = g(x, y, z), \quad \frac{dz}{dt} = h(x, y, z),$$

where f, g, h are continuous functions of x, y, z and satisfy certain conditions. The second part of the paper is devoted to a detailed study of the case when the functions f, g, h are linear in x, y, z .

The third part of the paper is devoted to a study of the case when the functions f, g, h are quadratic in x, y, z . The fourth part of the paper is devoted to a study of the case when the functions f, g, h are cubic in x, y, z .

The fifth part of the paper is devoted to a study of the case when the functions f, g, h are quartic in x, y, z . The sixth part of the paper is devoted to a study of the case when the functions f, g, h are quintic in x, y, z .

The seventh part of the paper is devoted to a study of the case when the functions f, g, h are sextic in x, y, z . The eighth part of the paper is devoted to a study of the case when the functions f, g, h are septic in x, y, z .

The ninth part of the paper is devoted to a study of the case when the functions f, g, h are octic in x, y, z . The tenth part of the paper is devoted to a study of the case when the functions f, g, h are nonic in x, y, z .

this country, and we could sell two or three times the number already exported without there being an appreciable shortage of work horses. Three times the number exported during the last four months of the past year, or 225,000, would be less than 1 per cent of our horse stock. Furthermore, the kind of horses which have been purchased are for the most part very mediocre animals, which would ordinarily sell for less than \$100 per head and are a class of which we can well afford to be rid. But a small percentage of the animals exported are mares and most of these are doubtlessly either old mares or nonbreeders.

"The big demand for horses will probably occur after peace has been declared. At that time the countries now at war, with the exception of Russia, will no doubt be very short of horses for their agricultural and other work. According to the best information obtainable European Russia had, prior to the outbreak of the war, about 25,000,000 horses, and is the only country having more horses than the United States. This country and Russia together have 50 per cent of all the horses in the world. The world's stock is estimated to be about 100,000,000. A very large number of the horses in Russia will be destroyed in the war and the remainder will no doubt be needed by Russia for her own agricultural and other work.

"The demands on this country, which has one-fourth of the world's supply of horses, will, therefore, be large and will probably continue for a number of years, for the rehabilitation of the depleted horse stock of any country is a slow process. This country, however, will be in a position to meet this demand if the farmer owning good mares will see that they are bred. The owners of such mares should see that they are bred to high-class stallions and produce the kind of stock for which there is always a good market. The production of superior animals of any kind is generally profitable, while the production of inferior ones is seldom so."

CORRESPONDENCE COURSES FOR TEACHERS OF AGRICULTURE IN IOWA.--The following is from a recent pamphlet * of the Iowa State College describing correspondence courses in agriculture for teachers conducted by the agricultural extension department of the college:

The courses announced in this pamphlet are designed primarily for teachers. A new State law soon to go into effect makes the teaching of agriculture, home economics, and manual training necessary in the schools and only a small per cent of the teachers of Iowa are prepared to teach agricultural subjects. It is not expected that these courses given by correspondence will be as thorough as those taught in class rooms, but for the great number of teachers who will not have opportunity to take a more complete course in agriculture the information given will be of assistance in teaching the subject effectively. An effort will be made to make the work practical and teachable rather than complete.

"A careful study of the lessons should enable any teacher to meet the requirements of the law concerning teaching of agriculture in the rural and grade schools. They have been prepared in accordance with the views of the State department of public instruction and has its indorsement.

"It is generally thought that agriculture is difficult to teach. This is not true if proper methods are employed. Therefore, not only is information given in these courses, but methods of teaching are also presented. Each lesson is prepared with the expectation that its instructions, modified to suit local conditions, will later be given to pupils, rural or grade. In other words, when the teacher has studied each lesson sufficiently to meet the requirements of the course, a lesson will also have been prepared suitable to be given in the school room. One or more exercises will accompany each lesson, each of

* Iowa State Col. [Pamphlet] 1914, Dec., pp. 6.

which can be carried out with a simple, available, and inexpensive apparatus, and in any school. Thus the complete sets of lessons, with exercises included, will form a volume of material that will be a valuable guide for future use in schools."

Lessons of Course 1, "Farm Plants and Soils" have been received. Course 2, "Farm Animals" is to be ready about April 1, 1915.

CONTINUATION SCHOOLS IN FARMING IN WISCONSIN.--The following is from a recent press bulletin of the University of Wisconsin: *

"An important link has been added to Wisconsin's educational chain. It is the county short course in agriculture which has been patterned after the first short course ever given in this country--that started in 1885 by Dean W. A. Henry at the College of Agriculture of the University of Wisconsin.

"It is expected that such courses will be given this year in all or many of the 11 counties which have county agricultural representatives, the work being under the direction of these men. A year ago five of these 'continuation schools in agriculture' were attended by 74 boys, who supposedly, in common with a great majority of the rural school children, had finished their schooling.

"The course consists of two winter terms with the intervening summer spent in home project work under the supervision of the county agricultural representative. The instructional work is given in agricultural subjects definitely related to the work of the farm. Students satisfactorily completing the course are granted certificates by the regents of the university."

RECENT AGRICULTURAL BOOKS AND BULLETINS.

Books.

- Fortier, Samuel. Uses of Water in Irrigation. New York, McGraw-Hill Book Co., 1915.
French, Allen. The Beginners Garden Book. New York, The Macmillan Co., 1914.
Hirshfeld, C. F. and Ulbricht, T. C. Gas Engines for the Farm. New York, John Wiley and Sons, 1915.
Howe, C. B. Agricultural Drafting. The Loose Leaf Drafting Manual. New York, John Wiley and Sons, 1915.
Larsen, C. Exercises in Farm Dairying. New York, John Wiley and Sons, 1915.
Levison, J. J. Studies of Trees. New York, John Wiley and Sons, 1915.
Lewis, H. R. Poultry Keeping. Philadelphia, Pa., J. B. Lippincott Co., 1915.
Moon, F. F. and Brown, N. C. Elements of Forestry. New York, John Wiley and Sons, 1915.
Woll, F. W. A Handbook for Farmers and Dairymen. New York, John Wiley and Sons, 1915, 6th. ed. rev.

U. S. Department of Agriculture Publications.

- Bul. 132 (1915), Correlating Agriculture with the Public School Subjects in the Southern States.
Farmers' Bul. 638 (1915), Laboratory Exercises in Farm Mechanics for Agricultural High Schools.

State Publications.

- Hummel, W. G. Utilization of Land by High Schools Teaching Agriculture.--Part 1, The School Farm. Reprint from Univ. Cal. Chron., 16 (1915), No. 4.

* Univ. Wis. Press Bul. 7 (1915), No. 8, p. 1.

which can be carried out with a single, available, and inexpensive apparatus, not in any school. Thus the complete sets of books, with exercises included, will form a volume of material that will be a valuable guide for future use in schools."

Lessons of Course I, "Farm Plants and Soils" have been received. George F. "Farm Animals" is to be ready about April 1, 1913.

CONTINUATION OF WORK IN TAKING IN WISCONSIN.--The following is taken from a press publication of the University of Wisconsin: "An important link has been added to Wisconsin's educational chain. It is the county agent course in agriculture which has been carried over from the State course given in this country--that started in 1905 by Dean F. A. Henry at the College of Agriculture of the University of Wisconsin. "It is expected that each summer will be given this year in all or many of the 9 counties which have county agricultural representatives, the work being under the direction of these men. A year ago five of these 'continuation schools' were attended by 75 boys, who, supposedly, in common with a group majority of the rural school children, had finished their schooling. "The course consists of two six or seven week sessions, summer and autumn, at home project work under the supervision of the county agricultural representative. The instructional work is given in agricultural subjects definitely related to the work of the farm. Students are actively cooperating the course are granted certification by the regents of the university."

RECENT AGRICULTURAL BOOKS AND BULLETINS

Books

- Forster, Samuel. Uses of Water in Irrigation. New York, McGraw-Hill Book Co., 1912.
French, Allen. The Bogomaz Garden Book. New York, The Macmillan Co., 1912.
Mitschelt, C. F. and Wilsch, T. C. Gas Engines for the Farm. New York, John Wiley and Sons, 1912.
Hose, C. E. Agricultural Engines. The Horse and Tractor Manual. New York, John Wiley and Sons, 1912.
Larson, C. Exercises in Farm Carpentry. New York, John Wiley and Sons, 1912.
Lawson, J. S. Studies of Trees. New York, John Wiley and Sons, 1912.
Leach, W. R. Fodder Crops. Philadelphia, Pa., J. B. Lippincott Co., 1912.
Moore, F. and Brown, W. G. Elements of Forestry. New York, John Wiley and Sons, 1912.
Woll, W. W. A Handbook for Farmers and Horticulturists. New York, John Wiley and Sons, 1912, 6th ed. rev.

U. S. Department of Agriculture Publications

- Bul. 122 (1912), Correspondence between the Public School Systems and the Southern States.
Bureau Bul. 122 (1912), Laboratory Exercises in Farm Management for Agricultural High Schools.

State Publications

- Hammel, S. E. Outline of Farm Management. Agricultural Extension--Part I. The School Farm. Report from State College, Wis., 1912, Vol. 4.